

AUDIT II

Country Report

LUXEMBOURG

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Final Report 19.09.2002



LUXEMBOURG

SUMMARY OF ENERGY AUDITING

The general *Energy Efficiency Law of 5 August 1993* has established the basis for the energy saving policy in Luxembourg. Five targets were set: to guarantee a sufficient, secure and economic energy supply; to promote energy savings and the rational use of energy; to favour the use of renewable energy sources, co-generation and the production of primary and secondary energy; to alleviate the negative impact of the production and consumption of energy on the environment and to co-ordinate all these activities in the framework of the European Union.

These targets were since translated into different regulations focusing on the main economic sectors, from individual housing to larger buildings and industry. Luxembourg has developed a national policy for energy efficiency including:

- A voluntary Energy Audit Programme for large buildings and industries
- An energy saving programme for municipalities
- Voluntary agreements with the industry
- A specific programme of support for low energy housing.

The objectives of Luxembourg in the field of energy efficiency are ambitious. In June 1998, the European Union Council of Environment Ministers reached a *Burden-Sharing Agreement* on emission reduction commitments, to re-allocate internally the 8% reduction agreed at Kyoto. The reduction commitments are expressed as a percentage of 1990 levels for the 2008-2012 period. Under the *Burden-Sharing Agreement*, Luxembourg is committed to reducing its emissions by 28%, the highest level of reduction in the EU.

Energy Audit Programme

The Voluntary Energy Audit Programme for large buildings and industry was set under the Grand Ducal regulation of 11 August 1996. The State subsidises 40% of the cost of the audit with a limit of 3.719.- € of financial support. The subsidy is paid when the audit is completed.

The auditors are engineers, advisers or specialised bodies agreed by the Ministry of Economic Affairs (Department of Energy).

The audit has to be performed according to a method proposed, that was derived from a German regulation.

As only very few demands for subsidies concerning this programme have been filed, the upper limit of the financial support has been recently increased to 30.000.-€.

Other programmes related to Energy Auditing

Voluntary Agreements have been negotiated by the former Minister of Energy as a tool to improve energy efficiency in the industrial sector. The first agreement was signed in March 1996. Since then, most industrial sectors have signed agreement with the Luxembourg government. The targets set range from 10% to 20% energy efficiency improvement by year 2001, with reference years set in 1990 or 1991 depending on the agreements.

Other Activities related to Energy Auditing

The P.E.E.C. (Programme d'actions d'Economies d'Energie dans les Communes) was set in 1996 to launch initiatives and measures adopted by the municipalities to promote the rational use of energy and renewable sources of energy. A subsidy of 30% to 50% is given by the State to municipalities for this programme.

The P.E.E.C. includes the definition by municipalities of an action plan called "concept énergétique", that aims to orientate the energy policy for 10 years. Although it is not compulsory, energy auditing is always part of this action plan. 10 municipalities have applied this procedure since the implementation of the P.E.E.C. , with very positive results.

The P.E.E.C. programme was launched in 1996 for a 5-years period and is no more applicable as such. However, most of its content has been integrated in an other programme managed by the Ministry of Environment.

Support to low energy housing

A Grand Ducal regulation of 2001 has launched a programme to support low energy houses. Financial incentives ranging from 25 to 100 euros/m² can be obtained for low energy houses or passive houses. The Energy Agency manages this programme and provides technical advises to owners.

In the framework of this programme, energy audits are performed on buildings plans, and a quality control audit is conducted after completion of the building.

Advising on energy efficiency to individual owners is becoming more and more frequent, and a programme is being studied that would allow the implementation of comprehensive audits including energy efficiency and environmental aspects (Impacts on energy consumption, air quality and health, etc.).

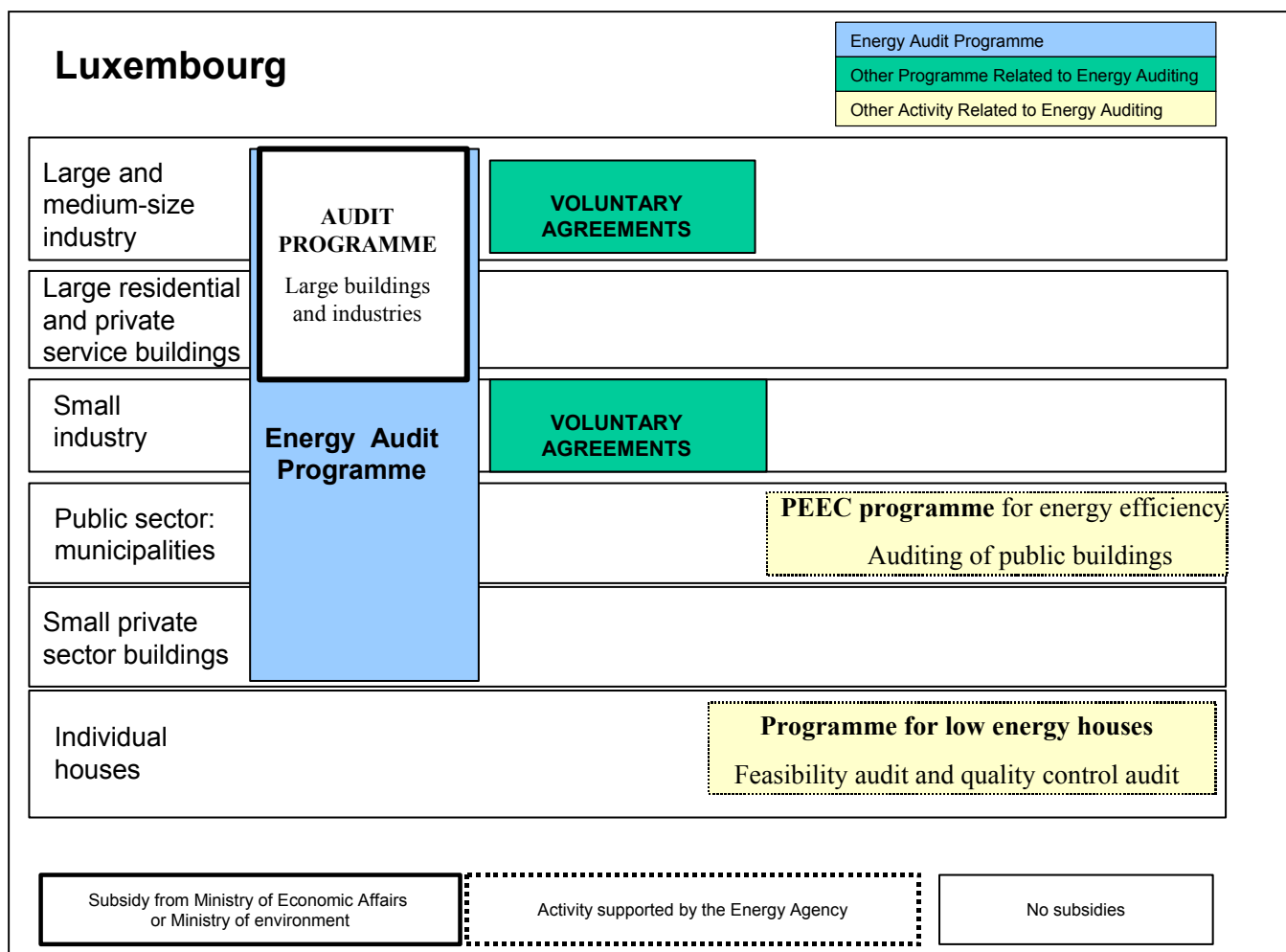


Figure 1. The Map of energy audits in Luxembourg

Table of EAP features coverage

| | Audit programme | Voluntary agreements |
|-------------------------|------------------------------|------------------------------|
| Status | 1996 - | 1996 - |
| Administration | Ministry of Economic Affairs | Ministry of Economic Affairs |
| EA models | + | + |
| Auditors' tools | - | - |
| Training, authorisation | ++ | ++ |
| Quality control | + | |
| Monitoring | + | ++ |
| Volumes, results | + | + |
| Evaluation | - | + |
| | | |

Energy Audits in Luxembourg

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Country Report

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Date of interview 10.04.2002

Disclaimer

The information contained in this report has been gathered from publicly available sources and through interviews. All efforts have been made to secure the veracity of the report, however the authors cannot guarantee the content.

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COUNTRY REPORT LUXEMBOURG

1 Background and present national policy

1.1 Previous activities

The Luxembourg government decided in November 1990 to stabilise anthropogenic emissions of CO₂ at 1990 levels by the year 2000 and to achieve significant reduction of these emissions by 2005.

The Energy Agency of Luxembourg was created in June 1991 to support the energy efficiency policy. The general *Law of 5 August 1993* then set the overall targets of Energy Efficiency in Luxembourg. Following the general framework definition, many Grand Ducal regulations were implemented in order to define action plans and programmes for energy efficiency and renewable energy.

Regarding energy auditing programme, the *Grand Ducal regulation of 11 August 1996* was set to organise energy audits in residential and commercial buildings, and in industry.

On the same date, the PEEC programme was adopted to support activities of municipalities aimed at energy efficiency.

In 1998, the National Plan for Sustainable Development was finalised, laying out a strategy for sustainable development in the different economic areas of Luxembourg.

The government considers these proposed measures as guidelines to meet the following objectives:

- To ensure security of energy supply.
- To diversify energy supplies.
- To develop highly efficient co-generation.
- To improve energy efficiency in all consumption sectors.
- To increase the use of renewable energy.

The 1998 National Plan for Sustainable Development sets as an objective a 20% reduction in energy intensity between 1993 and 2010.

1.2 Present national policy

Today, the main energy efficiency measures by sector are as follows:

General

- To introduce an energy tax compatible with EU regulations.
- To favour the use of the best available technology.
- To increase information and dissemination efforts.
- To favour investments for energy savings. The creation of a fund to promote renewable energy and energy efficiency is under discussion.

Buildings

- To improve the energy efficiency of new and existing buildings.
- To reach a 30% reduction between 1990 and 2020 in the energy consumed to heat a constant surface in buildings.

Industries

- To improve voluntary agreements.

Transport

- To set annual taxes on vehicles according to their fuel consumption and emissions to encourage the purchase of less polluting vehicles.
- To increase by 30% the share of public transport use for medium distances between 1997 and 2010.
- To reduce the use of transport and to reduce travel distances.
- To reduce the use of the most polluting transport means.
- To link Luxembourg's rail network to the high-speed rail network and to improve international railway connections.

1.3 Government structure and the Luxembourg Energy Agency

In 1999, the Ministry of Energy, previously in charge of energy efficiency policy and programmes, was changed to a Department of Energy within the Ministry of Economic Affairs. The Ministry of Environment is in charge of policy to curb air pollution and CO₂ emissions. Both ministries have authority for energy efficiency and renewable energy issues.

Following a government initiative, the *Agence de l'Energie S.A.* (Energy Agency) was established in June 1991 to support the rational use of energy policy, focusing mainly on individuals and municipal authorities. It was established as a company under private law whose shareholders are the government (50%), the electricity utilities *Compagnie Grand-Ducale de l'Electricité* (CEGEDEL) (40%) and *Société Electrique de l'Our* (SEO) (10%). The Energy Agency undertakes feasibility studies for energy efficiency and renewable energy projects and advises municipalities and individual owners. It has also managed the retrofitting of some micro hydropower plants with funding from the EU Thermie programme.

The Energy Agency is managing the building of a demonstration park in Remerschen, including an energy-efficient building, a 600 kW windmill and a photovoltaic plant.

2 Energy Audit Programmes

2.1 Voluntary Energy Audit Programme for large buildings and industry

In Luxembourg, energy audits for residential and tertiary buildings and industry are subsidised by the Ministry of Economic Affairs, according to the *Grand-Ducal regulation of 11 august 1996 for energy audits* (modified by the grand-ducal regulation of 13 January 2002, which increased the maximum level of financial support).

2.1.1. Goals

The goal of the energy audit programme is to encourage analysis of energy situation and energy saving potential in order to improve energy efficiency.

2.1.2. Target sectors

The target sectors of the programme are residential and private service buildings and industry, but only large businesses are eligible:

- * Residential and tertiary sector : Heating Power > 600 kW
Or Cooling Capacity > 300 kW
Or transformer capacity > 500 kVA
- * Industrial, craft, agricultural and commercial businesses where the total energy consumption (sum of all forms of energy consumed) exceeds 3 GWh per annum.

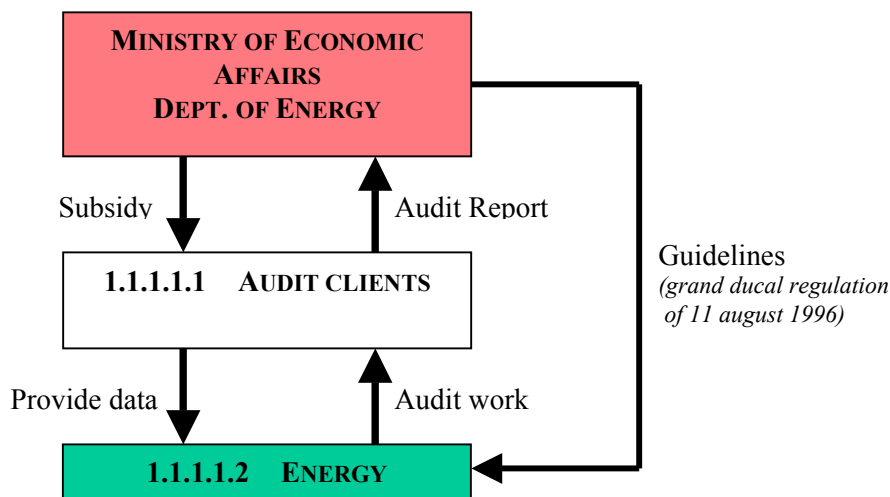
Public buildings are not eligible to this programme.

2.1.3. Administration

The Energy audit programme was previously managed by the Ministry of Energy and is now managed by the Department of Energy of the Ministry of Economic Affairs.

The Audit client is in charge of selecting an authorised auditor. To day, about 8 consultancy companies are authorised by the Ministry of Economic Affairs to perform energy audits.

The owner of the building or the company concerned has to submit a form to the Ministry of Economic Affairs to request the subsidy. The audit report and expenses report have to be annexed to the request for support. The subsidy covers only studies or parts of studies related to energy savings, rational use of energy, and new or renewable energy sources.



2.1.4. Implementing Instruments

The whole scheme is voluntary, based on state subsidies.

The amount of subsidy is 40 % of the audit actual cost with a maximum limit of 30 000 euros.

The subsidy is paid after the audit has been reported to the Ministry of Economic Affairs.

No real marketing schemes have been implemented to promote this programme. Luxembourg being a small country, it is considered that the knowledge of Luxembourg regulation should be easy. Furthermore, this programme is a central part to the second voluntary agreement concluded with FEDIL in April 2002.

The audit programme is part of the Law of 5 August 1993 setting the overall targets of Energy Efficiency in Luxembourg.

2.1.5. Energy Audit Models

There are official guidelines given to auditors setting the minimum requirements of an audit.

The audit must contain an analysis of the actual energy situation, an evaluation of the potential for energy savings, and different recommendations for energy efficiency improvement (including recommendations on the use of renewable energy and CHP).

The model adopted by the State of Luxembourg when issuing the 1996 audit regulation was directly taken from the German model "Mindestanforderungen an eine Vor-Ort Beratung".

The model is the same for industry and buildings.

It defines for the auditors:

- The range of equipments / buildings features to be audited
- The type of data that have to be collected and analysed
- The way recommendations of energy saving measures should be given
- The economic parameters to be given
- The range of proposals to be made
- The content and way of presenting the final results and reports.

The audit should address all elements that result in energy consumption, in relation to:

- production and associated activities
- heating and ventilation of the premises
- heating of sanitary water
- cooling of the premises
- lighting and office equipment in the buildings

Renewable energy sources and energy production have to be included in the audit.

► **The first part of the audit consists of the analysis of the existing situation.**

The building envelope is analysed. Key parameters are collected (surfaces, volumes, dimensions of walls, etc...).

The audit then targets the technical equipments (power, type of energy, etc...).

The energy consumptions are analysed: the auditor is requested to check data for a few years and give average data for a couple of years.

► **The second part of the audit contains recommendations with their costs and benefits**

All sectors are analysed: heating and cooling, ventilation, lighting, electricity generation, other equipments, etc.

For each identified measure, the auditor is requested to propose more than one solution, giving alternatives to the client.

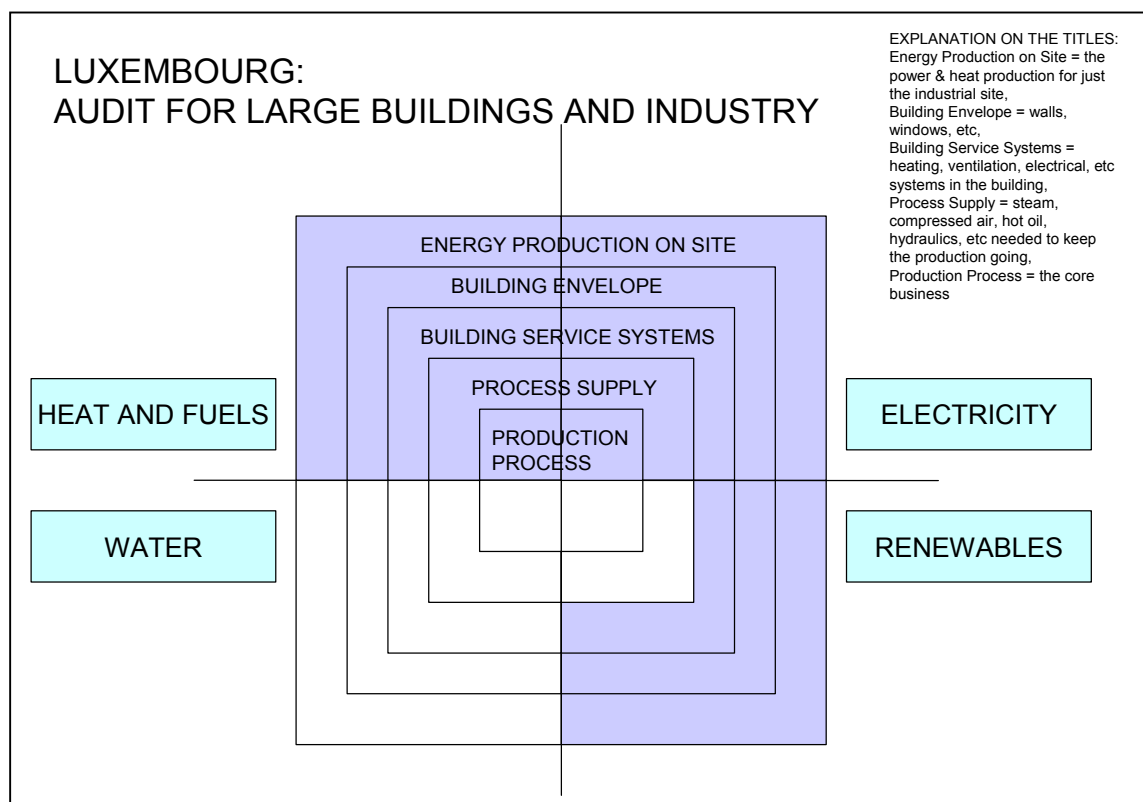
The auditor is requested to analyse the opportunity to use:

- renewable energy sources
- combined heat and power (CHP)

The cost of each recommendation has to be given with the pay-back time and profitability. The report should present the situation before and after the implementation of the recommendations made. The auditor is requested to calculate the impact of recommended measures on CO₂ and NO_x emissions.

► **Last part: meeting with the client to explain the he proposed improvements**

In addition to the meeting, the auditor is requested to include in the final report a summary and graphs that will be easily read by managers of the industry or owners of the audited buildings.



2.1.6. Auditors' tools

The 2-pages document detailing the procedure of the audit (as detailed above) is available for auditors.

No specific software has been developed for the audits.

The Department of Energy has however issued a technical leaflet and comprehensive handbook on thermal insulation, providing to consultants all legal elements, standards, calculation methods and thermal characteristics for a wide range of materials.

2.1.7. Training, authorisation and quality control

Only audits performed by an Engineer, a Consultancy Company or a specialised body authorised by the Ministry of Economic Affairs are eligible for subsidy from the State.

Individuals, private or public legal entities can obtain the authorisation to perform audits if they satisfy the following conditions:

- a) they have good technical or professional qualifications.
- b) they must
 - prove satisfactory knowledge of requirements relating to the technical duties and sufficient practice of these duties
 - have the appropriate technical means at their disposal and the personnel necessary to perform the technical duties
 - have access to the material and information required to complete their assignment properly
- c) they must have the ability to draw up the statements and reports of the studies and checks carried out
- d) they must be morally, technically and financially independent enough to do their work.

The authorisation procedure is made compulsory but the regulation detailing the procedure to be followed by consultants for authorisation has never been issued.

Consultants or potential auditors are requested to submit to the Ministry of Economic Affairs an application form including sufficient elements to demonstrate that the conditions set above are met.

8 consultancy companies have been agreed to date.

The Ministry limits the authorisation to a specified period and to the technical duties specified. The authorisation is renewable.

No real training sessions are offered to auditors (although the Energy Agency is proposing some training sessions on energy efficiency or renewable energy aspects, mainly addressed to municipalities or professionals).

No real quality control procedure has been developed. However, a copy of the final report is sent to the Ministry of Economic Affairs, allowing for a review of the quality of the audit.

2.1.8. Monitoring

Considering the very low number of audits performed in the framework of the audit programme, extensive monitoring procedures are not required. The ministry of Economic Affairs keeps record of the subsidies requested and corresponding final reports.

2.1.9. Auditing volumes

Only one audit has been supported in the framework of the grand ducal regulation of 11 august 1996 for energy audits.

It is important to note however that many audits have been performed in Luxembourg, either in the framework of voluntary agreements in the industry or in the framework of municipalities PEEC programme.

2.1.10. Results / evaluation

No more detail given on results, no real evaluation carried out.

2.1.11. Observations and Future Plans

The level of maximum support has recently been significantly increased (from about 3800 euros to 30 000 euros), showing the willingness from the Ministry of Economic Affairs to encourage audits.

Today, this programme suffers from a lack of awareness. The Energy Agency is considering the opportunity to better communicate on this programme and promote the subsidy available.

3 Other Programmes including Energy Auditing

3.1. Voluntary agreements

Since 1996, voluntary agreements have been negotiated with most industrial sectors, setting the objectives of energy efficiency improvement for a given period. In the framework of these agreements, energy audits are mandatory.

The Ministry of Economic Affairs has worked with the different professional sectors concerned : Industry (Industrial Federation of Industries (FEDIL)), Bank (Association of Luxemburgish Bank and Bankers (ABBL)), Insurance (Assurance Group), Hospitals (Hospitals Agreement), Commerce (Confederation of Commerce) and Hostelry (HORESCA).

These negotiated agreements have the advantage to result in concrete actions to improve the energy efficiency in the different sectors of the Luxembourg economy, whereas simple audits do not guarantee the implementation of recommended measures.

A first agreement has been signed in March 1996 with the FEDIL. Its aim is to improve the energy efficiency by 10% in the industry sector by year 2000. The year 1990 is considered as a reference date and most of FEDIL members have signed this agreement.

Industry has a part of 60% of the final consumption of gas and 66% of the final consumption of electricity. In 1998, the 48 companies analysed, had a global energy efficiency index of 0,87 for 1997 in front of 0,91 for 1996 and 1 for 1990. The index for 1998 is 0,86. These figures are showing that until now, an improvement of 14% has been reached.

A second voluntary agreement has been with the EHL for improving energy efficiency by 20% in the hospital sector by year 2001 (reference year: 1991). Seventeen hospitals and rest home are following this agreement.

In October 1997, a third agreement has been signed with the ABBL with the aim to improve the energy efficiency in financial sector by 20% by year 2001, 1991 staying the reference date.

Another voluntary agreement has been developed in 1998 with the hostelry sector. This agreement is integrated within a project called "ECOLABEL" which included added to the energy part, an ecological and tourism part.

All these agreements have the aim to reach a better management of the energy in existing buildings and industries following energy audit methodology.

4 Other Activities including Energy Auditing

4.1. Energy Saving Action Programme for municipalities (PEEC)

An Action Programme has been launched in 1996 to support initiatives from municipal authorities for rational use of energy and better use of new or renewable energy sources, under the Grand-Ducal regulation of 11 august 1996 - Programme d'actions d'Economies d'Energie dans les communes "P.E.E.C." .

To assist the municipalities, the Ministry of Economic Affaires is supported by the Luxembourg Energy Agency (AEL), which informs and advises – free of charge – municipalities on the overall strategy for energy saving and use of renewable energy sources.

The Energy Agency is in charge of achieving a first orientation study for the development of an energy concept project. Based on the conclusions of this study, consultants are then in charge of conducting a full-scale study including energy audits, and prepare a complete action plan, the "Concept énergétique", giving the energy policy orientations of the municipalities for 10 years .

A subsidy of 30 to 50% is given for the Energy concepts, according to the degree of innovation.
In April 2002, 10 municipalities had performed energy concepts.

In addition to the grants for the establishment of an energy concept, the Environment Ministry may grant a subsidy for certain energy saving and renewable energy technical installations and other investments.

The PEEC programme was launched for a 5 years period and is now over. However, the Ministry of Environment has integrated its content in a programme called "Fonds national pour la protection de l'environnement".

4.2. Support programme for low energy individual houses

A programme to support low energy houses has been introduced in 2001, under the grand-ducal regulation of 17 july 2001.

Its objective is to support studies and investments for low energy houses: based on the construction plan, an engineer of the energy agency or a consultant is carrying out an energy audit for new buildings projects. A set subsidy of 750 euros is granted to support this audit.

If the project leads to a low energy house or a passive house, significant financial supports may be granted:

- 5 Energy ratio $< 60 \text{ kWh/m}^2/\text{an}$, support of 62 euros/m² (over 140 m² of heated space, the support is 25 euros for the additional m²)
- 6 Energy ratio $< 15 \text{ kWh/m}^2/\text{an}$ (passive house) , support of 100 euros/m² m² (over 140 m² of heated space , the support is 63 euros for the additional m²)

A quality control is required to ensure that the set criteria are met. A 500 euros support is given to cover the corresponding expenses.

4.3. Carnets de l'habitat

A project called "carnets de l'habitat" plans to support comprehensive energy audits for individual houses. The Ministry of Housing is in charge of this project. Implementing procedures have not yet been set for this programme.

5 References

Reference material

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- Journal officiel du Grand-Duché de Luxembourg - Règlement grand-ducal du 11 août 1996 concernant la réalisation d'audits énergétiques dans les bâtiments du secteur résidentiel et tertiaire, ainsi que dans les entreprises
- Journal officiel du Grand-Duché de Luxembourg - Règlement grand-ducal du 17 juillet 2001 instituant un régime d'aides pour la promotion de l'utilisation rationnelle de l'énergie et la mise en valeur des sources d'énergie renouvelables
- Rapport Luxembourg 2001 - IEA

Web-sites

- www.etat.lu/ECO/
- www.iea.org

Currency

1 € = **40,3399 LUF**
(Since January 1999)